VOL. VI ITHACA, NEW YORK FASC. I

GENTES HERBARUM

Occasional Papers on the Kinds of Plants

By L. H. Bailey

Palms of the Seychelles

Published by The Bailey Hortorium
of The New York State College of Agriculture
at Cornell University
(Mailed at Ithaca Post Office to regular list)
February 11, 1942

1. Forest of Seychelles-nut, *Lodoicea maldivica*, on Praslin Island, most of the understory vegetation having been cleared.

General
Syd
L. H. Bailey
2-17-42

ARTICLE I.
PALMS OF THE SEYCHELLES ISLANDS.

In the American tropics and in southern Florida as well as under glass certain odd and ornamental palms are introduced, or at least their names occur, native in the Seychelles and Mascarene archipelagoes in the Indian Ocean. The genera are Lodoicea, Deckenia, Stevensonia, Roscheria, Nephrosperma, Verschaffeltia; Hyophorbe, Latania, Dictyosperma, Acanthophœnix.

Inasmuch as there is little native botanical material of these palms in the American herbaria and also scant literature available to our planters, I applied some years ago to the lamented Sir Arthur W. Hill, then Director of the Royal Botanic Gardens at Kew, England, for aid in obtaining specimens and notes from the original islands. Sir Arthur kindly put me in touch with reliable officials in the archipelagoes and requested from them materials to supplement the collections at Kew. The undertaking therefore became a coordinated enterprise. As the correspondence grew and specimens, notes and photographs accumulated, it became apparent that publication should follow. Nearly ten years ago there was consultation with Sir Arthur and others on the kind of publication, which is now begun. We start with the Seychelles.

Let it be understood that this paper is not intended as a monograph of the Seychelles palm flora, but rather as an aid to planters and interested parties in the American scene. The taxonomy of these palms appears not to require revision, but information is so frequently requested that I feel an obligation to supply it. The technical descriptions are drawn directly from abundant materials and evidences before me.

It is a pleasure to assemble a descriptive account of palms representing a single group of islands. This is apparently the first separate horticultural attempt for the Seychelles. I like to think of the Seychellan palms as a coherent problem and I am glad to be able to make explanation of the particular conditions under which they grow. When we grow palms we should be conscious of their native regions; such knowledge adds to the interest of growing them and we should be able to handle them with added confidence. If any of these Seychellan palms are in danger of becoming extinct on their islands we have the privilege of preserving them elsewhere. They are a beautiful and distinguished half dozen, and we should be proud to make appropriate use of them in our plantings.

The Seychelles

Seychelles is the name of an archipelago of many islands and islets lying in the Indian Ocean northeast of Madagascar, about 3–5 degrees south of the equator and somewhat east of the easternmost point of Africa. The group is geographically about 20 degrees south of Arabia. They are granitic islands and are supposed to be remainders in a land area once connecting Africa and India. The largest island is Mahé, on which is the important harbor and city, Port Victoria. It is 600 miles northeast of Madagascar and more than 900 miles from Mauritius in the Mascarenes. This island is 17 miles long and 7 or less miles broad, with a mountain rising to nearly 3,000 feet, and other points more than 2,000 feet elevation. Praslin Island lies 26 miles northeast of Mahé; it is 8 miles long and 3 or less miles broad, with an elevation of 1,260 feet; it is accompanied by several satellites. Mahé has an area of about 55 square miles, Silhouette of 8 square miles, La Digue of 4; none of the other islands is more than 1½ square miles in extent.

The islands were touched in 1609 by an English ship. They were visited again in 1742 by Captain Lazare Picault, who subsequently annexed the islands to France. The group was called Îles de la Bourdonnais, after Mahé de la Bourdonnais, governor of Île de France (now Mauritius). In 1756 they were renamed after Moreau de Séchelles, controller of finances under Louis XV. In 1814 the islands were ceded to the British, and, with other groups, now constitute the Colony of Seychelles.

The Seychelles were early cleared of the natural forests, and fires have swept large parts of the area. Agriculture has long been the leading occupation of the main islands. It follows that the primary vegetation is mostly lost or greatly reduced in extent, and it is now quite impossible to study its original characteristics with accuracy. The present palms may be remainders in the long existence of the islands.

Our knowledge of the palms of the Seychelles is derived largely from the excellent work of Isaac Bailey Balfour in Baker's Flora of Mauritius and the Seychelles, 1877. Preliminary works on the botany of these two archipelagoes are cited by Baker in his preface.

In 1931 V. S. Summerhays published a study on the origin and distribution of the Seychelles flora, together with an enumeration of species: Transactions of the Linnean Society of London, 2nd ser. xix, zoology, 261–299. The palms are not given special treatment, although *Cocos nucifera*, *Dictyosperma album*, *Latania Commersonii*, *Raphia Ruffia*, are listed as having been introduced and some of them more or less established. My recent correspondent writes that no exotic palms have really run wild on the islands. Summerhays states that *Cocos nucifera* is "generally cultivated but perhaps some naturalised."

Before this date Dr. L. Diels of Berlin had made an illustrated contribution on Der Vegetation und Flora der Seychellen in Carl Chun's Wissenschaftliche Ergebnisse der Deutschen Tiefsee-Expedition auf dem Dampher "Valdivia," Jena, vol. ii pt. iv, 1922. The palms of the islands are well pictured.

My correspondence on the palms of the Seychelles began with Mr. P. R. Dupont, Director of Agriculture and in charge of the Botanic Garden at Victoria, Mahé. His assistance is greatly prized. He was near the point of his retirement, however, and the program was passed to his successor, Mr. F. L. Squibbs, who made extensive collections of all the native palms. Mr. Squibbs, in turn, passed on the work to Mr. Desmond Vesey-Fitz-Gerald, entomologist then working on coconut pests for the Department of Agriculture and student of the vegetation of the Seychelles, who completed details of the collections and of photographs and who wrote me critical notes on the palms of the islands, and who is author of the accounts on range and habitat following the technical descriptions. To these gentlemen the reader is under obligation for the satisfactions he may find in this Fascicle.

When the engravings are marked as representing the item as it appears in the Seychelles, the photographs were taken by representatives of the Department of Agriculture there, in small size; the remaining pictures, about one-half the total number, are from photographs taken by the writer of this paper. Satisfactory pictures of some of the species have not been available to our horticulturists.

The palm forests of Seychelles

By D. Vesey-FitzGerald

The earliest visitors to Seychelles remarked on the abundance of palms, especially on the island of Praslin which was indeed originally called the isle of palms. Even today the prominence of palms in the relic primary forests as well as in areas of secondary growth remains a feature of the vegetation. An examination of the species involved reveals the even more significant fact that all the six native species belong to monotypic endemic genera, a list including the world famous "double coconut" or coco-de-mer, *Lodoicea maldivica*. The reason for this extraordinary assemblage of unique species on a minute and isolated group of islands may never be elucidated.

The Seychelles archipelago consists of twenty-nine islands of varying sizes. They are all more or less adjacent. The distance between the southernmost, Mahé, and northernmost, Aride, is 25 miles. The distance between the westernmost, Silhouette, and easternmost, Frigate, is 42 miles. Geologically they all consist of granitic rocks which under the process of weathering yield red lateritic soil. Topographically they are all rugged, the larger islands precipitously mountainous culminating in the approximately

2. VIGOROUS YOUNG TREE OF SEYCHELLES-NUT, unfortunately usually known as "double coconut." Jamaica. Seed was planted in 1896 and this picture was taken in 1935. There has been little change in stature subsequently. It is a staminate tree, and three catkins may be seen at lower left. Note the midrib continuing through the leaf-blade. *Lodoicea maldivica* (*L. sechellarum*).

3,000 foot summit of Morne Seychellois, while the smallest ones are little more than sea-washed rocks.

The native palms are not distributed throughout the archipelago. They are characteristic only of the islands of Mahé and the islets around its coast, of Silhouette, and of Praslin and its satellites Curieuse and Round Island. On LaDigue and Félicité palms are very poorly represented. It should, however, be noted that on neither of these two islands, nor on the remaining small islands, is there any primary vegetation at all. At the same time there is no reason to suppose that palms were ever a feature on these islands even at the time of their discovery, because, firstly, the narratives of early visitors do not record the fact, and secondly, palms usually persist in second-growth vegetation.

Palms are a relatively archaic type of plant and it seems probable that the Seychelles palms in particular are relics from very early times when a predominantly palm flora was the characteristic vegetation of a large land area that may then have existed in the Indian Ocean.

The significant facts that point to this conclusion are, first, the uniqueness of the species, indicating a very ancient history; secondly, the fact that every type of terrain from sea level to the mountain tops supports one or more species of palm, indicating a wide local distribution of the species considered collectively; thirdly, the fact that a more decimated but at the same time quite definite and unique palm flora is recorded from other islands in the Mascarene area (Vaughan and Wiehe, 1937–9), indicating a former close connection between these very scattered islands. Palm domination appears to have waned as a result of two main causes. First, the land area became broken up into islands which resulted in the destruction of the homogeneity of the environment which facilitated the second factor, namely the invasion of other plant formations.

Very small islets became unsuited to palms and a more maritime vegetation took their place. On the larger islands the present-day variable incidence of the existing palms is entirely in unison with what would be expected to happen under the circumstances of one kind of flora replacing another. The different stages of this replacement are all discernible. On the medium-sized islands, such as Félicité and LaDigue, as far as can be made out, palms were very largely replaced by forests of broad-leaved trees belonging to a littoral formation, which on these islands of medium elevation was able to persist to the tops of the hills. On the large islands, such as Mahé and Silhouette, the greater variety of terrain afforded a place for all forms of vegetation. The littoral formation encroached up the hillsides but was ever held back by a more intermediate type of forest of the endemic Northea-Neowormia association, a modified form of which covered the highest mountains. Palms, abundant though scattered, survived throughout, and

under certain peculiar conditions of the environment can still be found forming little pure stands or palmeta.

Praslin and Curieuse together retain the more primitive type of flora. On these islands the palms have survived as dominants to the present time, and on these islands alone has the coco-de-mer survived. It would be illogical to suppose that the coco-de-mer was evolved under the conditions or within the restricted compass of its present-day habitat. The coco-de-mer must be considered a relic from a much more glorious past.

The coco-de-mer, the most outstanding and dominant palm of the Seychelles palmeta, is a gregarious species and in the ordinary way is apparently not able to persist if the species becomes scattered. If the above thesis is correct, it is evident that in the face of competition with other forest elements, the coco-de-mer would not survive where the natural irregularity of the land, due to numerous boulders, prevented the coco-de-mer from preserving a close canopy. On the earth banks of Praslin and Curieuse the coco-de-mer was able to persist in pure unbroken stands, and it is here that the species survived.

The corollary which follows is, of course, that so long as the predominant palm formation was preserved in its entirety the subsidiary species enjoyed immunity from competition, and the survival of the more primitive vegetation of Praslin is explained.

THE GENERA AND SPECIES

The six species of Seychellan palms belong to six genera. They are all endemic to the Seychelles archipelago, being known as native trees nowhere else in the world. They represent six distinct types, as we shall now discover. All of them require artificial protection in southern Florida.

We shall find our trees falling into the tribes Borasseæ (Lodoicea) and Areceæ; the former or Borassans bear fan-shaped very heavy leaves (*costapalmate*: the rib extending through the blade: see Gent. Herb. iii, 285, in the Sabal paper) and the two sexes are on different plants; the latter or Arecans bear pinnate or pinnately veined leaves, and the sexes are separate in the same spadix or cluster. In Lodoicea we find the largest single fruit and seed in the vegetable world, reported up to 40 and more pounds in weight; in the others the largest fruits are not above an inch in diameter. It is strange that such different types of palms should be endemic to a small group of remote islands.

I. Species diœcious, the large pistillate flowers sunken in thick clumpy more or less zigzag rachis, the staminate in great catkins: fruit enormous, weighing many pounds, covered in fibrous envelope, nut deeply lobed; cotyledon extensively developed in germination: plant spineless throughout: leaves very large, costapalmate.—*Borasseæ, the Borassan palms*..... I. LODOICEA

II. Species monœcious, the small flowers borne on the surface of slender drooping

rachillæ: fruit small, 25 mm. (1 inch) or less in longest diameter, not in fibrous husk, nut not deeply lobed; cotyledon not exaggerated in germination: plant spiniferous on some of its parts, particularly when young: leaves pinnate or pinnately veined or cut.—*Arecæ, the Arecan palms.*

A. Fruit oblong, length 2–3 times the breadth, 10–13 mm. (about ½ inch) long: nutlet not furrowed.

B. Leaves at maturity long-pinnate, the pinnæ equal and 60 or more pairs: inflorescence infrafoliar: spathes usually densely spiny: rachillæ long-drooping: stamens 9: albumen plain.....2. DECKENIA

BB. Leaves pinnately cut to about ⅓ depth of blade: leaf-sheaths and petiole and young trunk spiny, spathe unarmed: inflorescence interfoliar: rachillæ spreading and declined, hardly hanging: stamens 15–20: albumen ruminate.....3. STEVENSONIA

AA. Fruit globose, shot-like or bullet-like (not cartridge-like): inflorescence interfoliar: albumen ruminate.

B. Mature fruit shot-like, about 5 mm. (¼ inch or less) in diameter: leaves very unequally pinnate, some of the pinnæ 2–4 times as broad as others on the same leaf: leaf-sheaths spiniferous, as well as the trunk in young plants: stamens 6.....4. ROSCHERIA

BB. Mature fruit bullet-like, 10 mm. or more thick.

C. Nutlet not grooved or ridged, the fruit 10–12 mm. thick: pinnæ 40 or fewer pairs, about equal in width: spathes sparsely or weakly spiny: stamens 40 or more.....5. NEPHROSPERMA

CC. Nutlet prominently grooved or ridged, the fruit 20–25 mm. (about 1 inch) thick: leaf very unequally divided to near the midrib, not regularly pinnate: spathe unarmed, spadix long and erect: stamens 6.....6. VERSCHAFFELTIA

1. **LODOICEA**, Comm. ex Labill. in Ann. Mus. Hist. Nat. Paris, ix, 140, 1801 (1807); ex J. St. Hil. in Exposition des Fam. Nat. i, 96 (1805).

Monotypic genus in the Seychelles; for our purpose sufficiently described in the following diagnosis.

Lodoicea maldivica, Pers., Syn. ii, 630 (1807). SEYCHELLES-NUT. COCO-DE-MER. Figs. 1–2, 4–17.

Cocos maldivica, Gmel. Syst. 569 (1791) as *maldioica* but corrected to *maldivica* in second ed. 569 (1796).

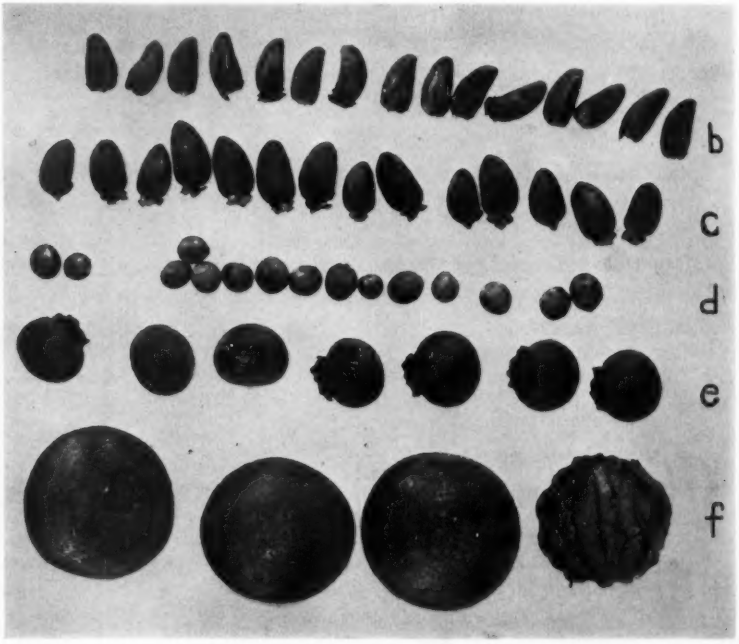
Borassus Sonnerati, Giseke, Præl. Ord. Nat. Pl. 86 (1792).

Lodoicea Sechellarum, Labill. in Ann. Mus. Hist. Nat. Paris, ix, 143, 1801 (1807).

Lodoicea callipyge, Comm. ex J. St. Hil. in Exposition des Fam. Nat. i, 96 (1805).

Spineless dicœcious tree with single straight very erect trunk (not soboliferous) that in age is slender in proportion to its height, obscurely annulate, nearly uniform in thickness except somewhat expanded at base, reaching 30 m. in height but fruiting when only a few feet tall (staminate tree said to be usually the taller), the crown a rather dense head of foliage,

lower leaves themselves hanging: plant making a base of sclerenchymatous tissue that remains as a bowl-like body long after the tree has matured and perished (picture in Gardeners' Chronicle, Jan. 21, 1893, p. 69): leaves stiff and heavy, texture metal-like, palmate or flabellate but petiole running through the blade (costapalmate) almost to end, petiole 2–4 m. long and unarmed, blade 4–6 m. long and 2–4 m. broad, plicate at base and bearing scurf on the folds but otherwise glabrous although sprinkled with minute dots, cut one-third or more its depth into segments 4–10 cm. broad, the bifid ends of which are variously drooping in age, surfaces glossy above and conspicuously cross-lined particularly on the lighter colored not shining under face, midribs very prominent but the few side ribs not strong, filaments lacking; petiole splitting at the expanded base: spadices in lower axils, lacking a covering spathe but provided with large bracts at base, flowers immersed; pistillate spadices 1–2 m. long, declined or somewhat horizontal, crooked or zigzag, the axis 5 cm. or more thick and bulging at insertion of flowers, peduncle perhaps 30–40 cm. long; staminate spadices 1–2 m. long, spreading or hanging, terete and tapering, as thick as a man's arm, peduncle very short: pistillate flowers single at



3. FRUITS OF THE ARECAN PALMS, all from the wild in the Seychelles but photographed at Ithaca; natural size: *b*, *Deckenia nobilis*; *c*, *Stevensonia Borsigiana*; *d*, *Roscheria melanochætes*; *e*, *Nephrosperma Vanhoutteanum*; *f*, *Verschaffeltia splendida*, one of them with the exterior removed.

the angles of the thick rachis and partially sunken in it and held in a great cup composed of a pair of very broad infolding bracts that remain on the rachis, the flower consisting of a conical pointed ovary of 2–4 (usually 3) cells, 5–10 cm. thick, covered one-half to two-thirds its length by 6 very broad imbricating envelopes indistinguishable as sepals and petals except by the sequence of inner and outer, stigmas sessile, staminodes minute: staminate flowers several in each deep cavity of the catkin that extends from the periphery to the central axis and is covered tightly by imbricated applicate bracts from near the center of the edge of which the stamens exsert at anthesis; stamens many (14 or more), the linear anthers about equalling the tube of filaments, petals 3 with oblong obtuse free blades and conjoined bases, sepals 3 and covering tube of petals, pistillodes minute: fruit an immense and heavy ovoid flattened body 40–50 cm. long, usually 1-seeded by abortion, covered by a thin fibrous husk, the nut or pyrene with thin shell that is hard at maturity and 2–4-lobed (commonly 2-lobed but not "double") by intrusion of the walls, the base sitting in the greatly enlarged imbricated floral envelopes; lobing (in the usual 2-lobed nut) not equal on both ends and sometimes the upper sinus lacking, the basal sinus deep and expanded or truncate at its apex, flat face of nut bearing a tufted fold or ridge (raphe?) in upper part of valley toward the top; nut filled with a continuous non-ruminated white albumen that is at first jelly-like but with full maturity hardens about the outside, the central part remaining soft until the last, all the contents finally becoming exceedingly hard or shrivelling away; embryo at bottom of isthmus between the lobes, the micropyle at the top of the basal sinus; section crosswise the top of a mature nut may disclose abortive locules, filled with spongy tissue.

Endemic on hillsides and in valleys on Praslin Island and its immediate satellites, Curieuse and Round islands, Seychelles archipelago.

The common name in English for this remarkable palm is Double Coconut. This name I regret and I am no longer using it, for the reasons that the palm is in no way a coconut and the nut is not double but lobed: four-lobed nuts are reported, and the elder Hooker pictured a three-lobed nut as long ago as 1827. In fact, six-lobed fruits are recorded, as by W. Botting Hemsley in Gardeners' Chronicle for March 11, 1916: it is well known that the fruit "is usually two-lobed, sometimes three-lobed, and very rarely six-lobed."

This great palm was called Cocos or Cocus by early writers, but that was before the critical differentiation in palms had been begun by trained botanists. As we now correct the botanical inaccuracies it is also time to discontinue the errors in popular speech.

The relationship of Lodoicea is with Borassus and the other Afro-Asian genera Borassodendron, Latania, Hyphæne, Bismarckia, Medemia. These are heavy fan-leaved dicœcious palms whereas the Cocos kinds are feather-leaved monœcious plants with very different fruits. The late Odoardo Beccari, celebrated palm student of Italy, monographed the tribe Borasseæ, and the contribution was posthumously published in folio in Florence in 1924, with plates.

4. STAMINATE CATKIN OF SEYCHELLES-NUT, *Lodoicea maldivica*. Jamaica. About one-seventh full size. These catkins emit a strong odor when in bloom and are attended by bees.

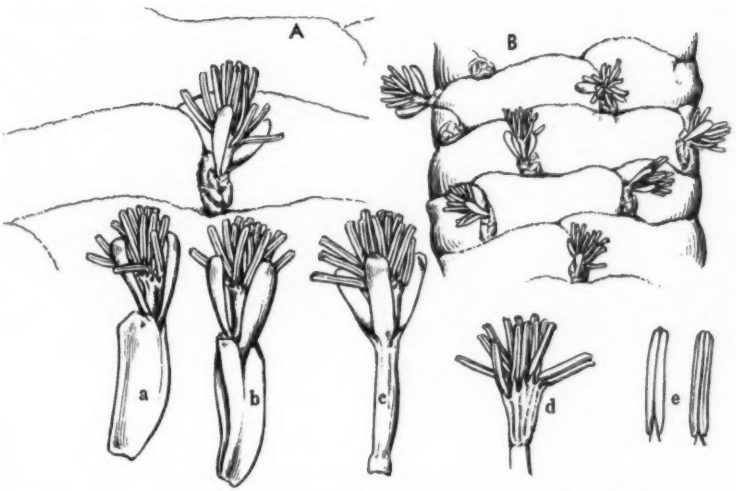
Seychelles-nut has been the subject of much writing. For centuries it was one of the wonders of the world. The great nuts, devoid of husks and the interior perhaps decayed, washed up on the shores of the Indian Ocean, whence the name coco-de-mer, sea-coco. They must have been dead, else the palm might have taken root on some far strand even though it is not a shore palm; nuts were probably carried to sea from the streams. They were supposed to have come from the Maldive islands, an archipelago of atolls and coral reefs some 300 miles south of Ceylon. This old idea is embodied in the earliest acceptable binomial, *Cocos maldivica*, now transferred as *Lodoicea maldivica;* persons may regret this specific name now that the nativity of the palm is known, but it has intrinsic merit as well as botanical authority in preserving a cogent history otherwise likely to be overlooked. This name goes back at least to old Rumphius, who, before the time of botanical nomenclature, called the nut *Cocus maldivicus.*

5. PART OF A STAMINATE CATKIN of Lodoicea, natural size. Jamaica. The floral envelopes are straw-colored and brown; bottom of flower when pulled out of its socket whitish.

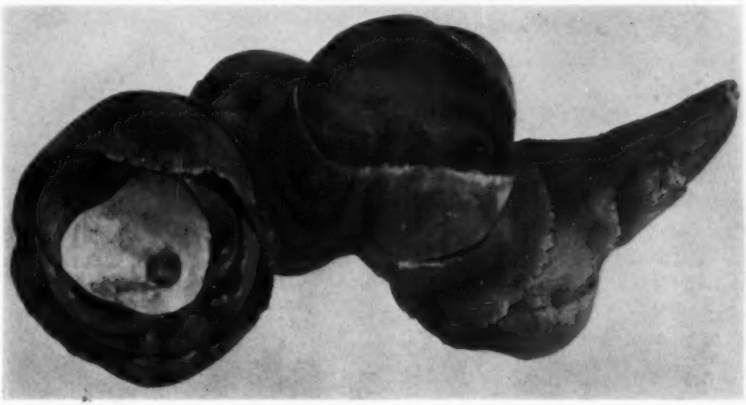
Gmelin's bestowal of the name *maldivica* in 1791 was therefore not original with him. His account of the species, *Cocos maldivica*, was made with very brief and inadequate diagnosis, after the practice of that time, but there is no doubt of the palm intended since he refers to the article and plates of Sonnerat published in 1776.

Pierre Sonnerat, sub-commissioner of marine, naturalist, pensioner of the King of France, correspondent of his cabinet and of the Royal Academy of Sciences of Paris, undertook a voyage to New Guinea, in the course of which he visited the Seychelles. His interesting tome, Voyage a la Nouvelle Guineé, 1776, is before me as I write. The embellished frontispiece shows the cocotier-de-mer among other wonders, and the first chapter of the book, ten pages and plates, is devoted mostly to this palm. This is apparently the earliest definite naturalist's account of the palm drawn from observations on Praslin or Île des Palmiers. He does not bestow a Latin or botanical name. His pictures have scientific merit, although the plate of the palm tree itself, like those of other early authors including Martius, does not properly represent either the foliage or the straight rigid trunk. Photographs show the fan-shaped nature of the mature foliage, and the leaves are not pinnately veined as the pictures portray them, as if they were windvanes. Perhaps the crooked trunks in the pictures are a result of the subconscious association of the palm with the coconut, through the name "double coconut," as well as the tendency to represent it in a seaside habitat. In more recent time we have had engravings made directly from photographs in nature, and the appearance of the palm should now be comprehended.

In 1801, J. J. H. de Labillardière published a paper in Annales du Museum d'Histoire Naturelle of Paris on the coconut tree of the Maldives (Sur le Cocotier des Maldives). It is a brief paper of a half dozen pages and a full page plate, but it is important that the palm here acquired a definite botanical name. The title was bestowed by Philibert Commerson, born 1727, of Bougainville's voyage, and who died in Île de France (Mauritius) in 1773. He proposed the name Lodoicea in his manuscript, and Labillardière adopted it and added the specific name *L. Sechellarum*. No other generic name has been proposed for the Seychelles-nut after having been lodged in the inclusive title Cocos. Name Lodoicea is said to be a modification of Laodice, daughter of Priam, king of Troy. It may be pronounced Lodoï-cea. Labillardière's paper was not regularly published in the volume of the Annales until 1807, but probably it was circulated in print before that time. The name had become current in advance of that formal date, as attested by its appearance in Jaume Saint-Hillaire's Exposition des Familles Naturelles in 1805, with the combination *L. callipyge* attributed to Commerson. This specific name is the oldest one under the genus if Labillardière is dated



6. DETAILS OF STAMINATE FLOWERS of Lodoicea. A, flower issuing from the scales, × 1. B, piece of the catkin, × ½. Other flowers about twice full size: *a*, *b*, showing the outer envelopes or calyx, at base; *c*, calyx removed, exposing corolla-tube; *d*, stamens, connate below; *e*, anthers.



7. PIECE OF PISTILLATE AXIS of Lodoicea, × ½. At left, pistillate flower, with its six envelopes. On upper part is the two-bracted cup from which the flower has fallen. Photographed at Ithaca from dry material. At this stage the big ovary bears an unusually thick fibrous content, ripening into the relatively thin husk.

1807, but his own binomial *L. Sechellarum* probably gained earlier currency and it has persisted in most of the later accounts. At all events, both these names are antedated by *maldivica*, which Persoon brought over to Lodoicea from Gmelin's Cocos. (Cf. E. D. Merrill, An Interpretation of Rumphius's Herbarium Amboinense, 112, 1917).

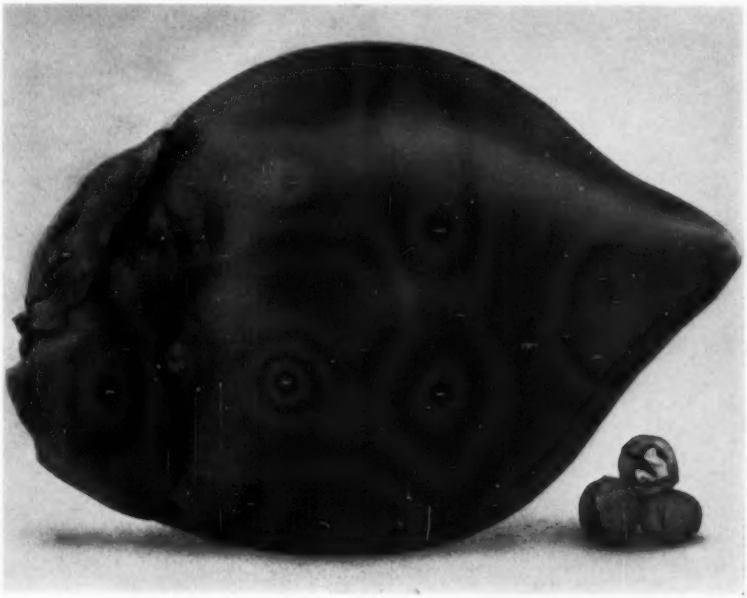
In 1827 appeared a full botanical account of Lodoicea in Botanical Magazine under the editorship of William J. Hooker with five colored plates (tt. 2734–2738) and outline of the history, the native material and information having been supplied by Mr. J. Harrison of the Seychelles. This writing still remains the standard reference on the Seychelles-nut, and from it many of the subsequent accounts have been largely drawn. We learn from this and other writings that through centuries this nut, caught in the currents to the Maldive islands, was subject of mystery and superstition. It was not known whether the body was vegetable, animal or mineral. Persistent tales were to the effect that it grew on submerged trees in the neighborhood of Java and that the trees astonishingly disappeared when sailors dived for them. Another tale is that in far tropical seas the tree came above the water and in the top of it there lived a griffin or vulturous bird that went landward and devoured elephants and tigers and rhinoceroses; and inalert humans were drawn to the place on their ships by the waves that surround the tree and there fell prey to the monster.

The nut was an antidote. George V. Nash writes in Journal of the New York Botanical Garden (vii, page 8) that "its reputed value as an antidote to poisons made its acquisition greatly to be desired" by princes and potentates, "who, prone to use such poisons on others, were constantly in fear of being made victims themselves of some wily poisoner. It is not strange that they were willing to pay large sums for these mysterious objects which would protect them from their enemies. They firmly believed that water which has been kept in one of these was purified from all harm, and could be drunk with impunity, no matter how active may have been the poison placed in the liquid." In antitoxic and medicinal virtues the nuts were supreme and this is attested by the name *Nux medica* applied to them as early as the fifteen hundreds.

Kings coveted possession of the strange nuts and other persons were not allowed to possess them. In fact, Hooker states that "some kings have been so greedy of obtaining these fruits, as to have given a loaded ship for a single one."

The source of these nuts was disclosed by the discovery of Praslin Island in 1743, and the mystery vanished. Now the nuts, mostly with the fibrous husk lacking and therefore showing the "double" form, are seen in museums and they are planted under glass and in warm countries about the earth. On the island of Jamaica I know a single tree, a staminate: it is shown in

8. PISTILLATE FLOWERS AFTER FECUNDATION PERIOD of *Lodoicea maldivica*. × 1.



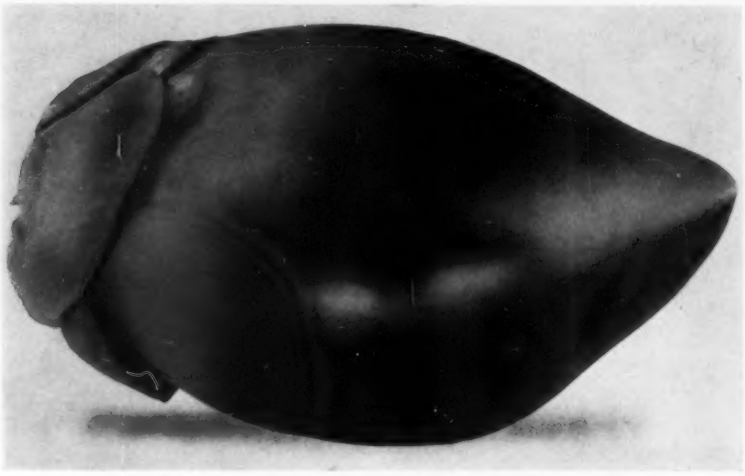
9. FRONT OR BROAD VIEW of Lodoicea fruit pictured at Ithaca when freshly received from the Seychelles, surface blemishes not showing. × ¼. Three walnuts for comparison in size. On receipt this fruit weighed 30 pounds; the smooth surface was dull old-leather brown. Its length was 18 inches, width broad way 13 and thickness 9 inches.

Figs. 2 and 4. On Trinidad a good specimen grows on the grounds of Government House at Port-of-Spain. There are bearing trees in British Guiana, Fig. 15. A small tree in a tub has long been an attractive object in the conservatory of the New York Botanical Garden at the Bronx. A small plant grows out-of-doors but with protection in the Plant Introduction Garden at Coconut Grove, Florida, and others are under experiment at the Montgomery Palmetum nearby. One sees them in conservatories in Europe. Mention of this palm still arouses the interest and mystery of novelty.

In its native islands this palm is a prime source of building and other usable materials and the content of the nut is eaten when still in the jelly stage.

Naturally the Seychelles-nut requires a full tropical climate for its proper development, and good growing conditions. The intending planter may be guided by the remarks on habitat and ecological conditions under which the palm grows on its native islands. It is written that the natives think the shape of the nut indicates the sex of the plant that arises from it, but this is not verified.

The most extended single contribution on Lodoicea is by Albert-Auguste Fauvel, 1851–1909, native of Cherbourg in France, naturalist, traveller, public servant, long resident in China where he became a distinguished sinologue. His paper on Le Cocotier de mer des Iles Seychelles, covering about 140 pages, appeared in Annales du Musée Colonial de Marseille,



10. Seychelles-nut, same as Fig. 9, seen sidewise, nine inches thick. × ¼.

series 3, volume iii, 1915. It is a full historical and botanical discussion, with many plates some of which display the articles made from the shells of the nuts. There are pages of bibliography, in chronologic order.

On the field characteristics of Lodoicea and also its distribution on its

11. SEYCHELLES-NUT, *Lodoicea maldivica*, with outer shell removed from lower half. This shell is smooth on the outer surface, but loosely woven with coarse longitudinal fibers on the inside, making a covering less than one inch thick. Photographed as received from the Seychelles, after the husk had begun to split

islands more than seventy-five years ago I make quotations from Swinburn Ward in Journal of the Linnean Society, Botany, viii, 135–139, written from the Seychelles in 1863, the account having been communicated by Sir W. J. Hooker.

"The shortest period before the tree puts forth its buds is thirty years, and one hundred years must elapse before it attains its full growth. No one can tell how long it will last, or how old some of the gigantic specimens may be. No nuts planted since the British came into possession have arrived at their full growth. One in the garden at Government House, planted fifteen years ago, is still quite in its infancy, about sixteen feet in height, but with no stem yet visible, the long leaves shooting from the earth like the Traveller's Palm (*Urania speciosa*), and much resembling them in shape, only much larger. Nine months after the nut has been planted, supposing germination to have begun at once, the leaf sprouts at an angle of 45° from the root; it is very closely folded, with a smooth hard surface, terminating in a sharp point. When about two feet above the surface it expands, and nine months after another leaf follows, coming up the grooved surface of the midrib of that which preceded it, and so on at intervals of nine months, each succeeding leaf becoming larger in size. All these leaves cluster together and support each other, no stem appearing above the ground. From the age of fifteen to twenty-five the tree is in its greatest beauty, and the leaves at this period much larger than they are subsequently. They consist of two layers of fibers crossing each other at right angles, imbedded in a thick stratum of parenchyma enclosed in a tough skin.

"The stem of the full-grown tree, like that of all Palms, consists of hard fibers imbedded in medullary substance enclosed in a hard sheath, so hard that a good axe is required to cut it. It splits readily, but is extremely durable. Unlike the Cocoa-nut trees, which bend to every gentle gale (*flecti sed non frangi*), and are never quite straight, the Coco de mer trees are as upright as iron pillars (*frangi sed non flecti*), undisturbed in their position by the heavy gales and violent storms so often occurring in tropical regions.

"The female blossoms spring from a strong stem forming a regular zigzag, and are composed of three bracts three or four inches in diameter. A gummy secretion exudes from the apex of these, which secretion doubtless arrests and secures the pollen necessary for their fecundation. The fruit-stalk is supported by three very strong bracts; the outer one of these, the top of which is wedge-shaped, penetrates the stalk of the leaf immediately above it, in the under side of which nature has left a fissure accessible to it. By this provision the stalk is enabled to support the weight of fruit which hangs upon it, sometimes exceeding four hundred-weight. Eleven nuts have been seen on one stalk, the probable weight of each being about

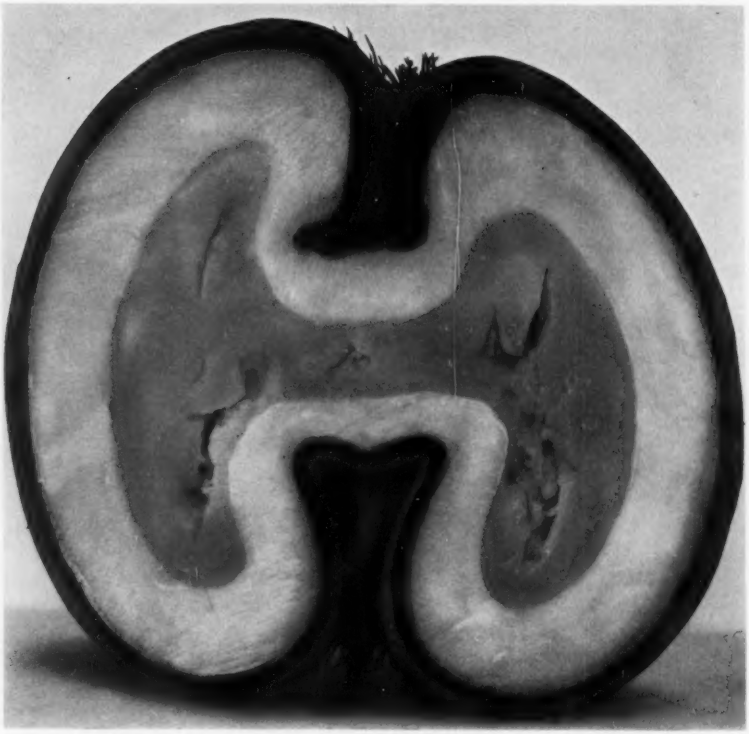
forty pounds. Such clusters are, however, very rare, and four or five may be taken as the average number on one stalk.

"The arrangements provided by nature for the roots of both male and female trees are of a most peculiar nature, quite distinct from those provided for any other known tree. The base of the trunk is of a bulbous form, and this bulb fits into a natural bowl, or socket, about two and a half feet in diameter and eighteen inches in depth, narrowing towards the bottom. This bowl is pierced with hundreds of small oval holes about the size of a thimble, with hollow tubes corresponding on the outside, through which the roots penetrate the ground on all sides, never, however, becoming attached to the bowl; their partial elasticity, affording an almost imperceptible but very necessary 'play' to the parent stem when struggling against the force of violent gales.

12. Nut of Lodoicea after removal of the outer shell or husk. × ⅓. Note the fold or ridge at top of sinus.

"This bowl is of the same substance as the shell of the nut, only much thicker. As far as can be ascertained, it never rots or wears out. It has been found quite perfect and entire in every respect sixty years after the tree has been cut down. At Curieuse many sockets are still remaining which are known to have belonged to trees cut down by the first settlers on the island.

"No suggestions will induce proprietors to abandon their present habit of wilfully destroying the trees for the sale of the nuts and leaves, or to take some pains for the cultivation and reproduction of this magnificent Palm. Not many years will elapse before the Coco de mer becomes in reality as rare as it was supposed to be when first picked up at sea by the wondering mariners, and the only relics left of its former magnificence will be the



13. UP AND DOWN SECTION OF THE NUT shown in Fig. 12. This section measured 10½ inches lengthwise, and 11½ inches broad. The very hard shell was ⅜-½ inch thick. It was a fresh nut from the Seychelles with white flesh, the outer part of which was denser and with a creamy tinge. *Lodoicea maldivica*.

decaying blackened stumps of the trees so wantonly destroyed, and the curious sockets in which they stood for so many years."

Present distribution of Lodoicea in the Seychelles (Vesey-FitzGerald)

Lodoicea was apparently confined to the hill slopes and valleys of Praslin and Curieuse and to the adjacent islets, Round, St. Pierre and Jeannette (which is probably the same as that known as Chauve-Souris today). This palm was not found on the coastal plateaux (Malavois 1787 quoted in Fauvel 1909, p. 239 et seq.). There is no evidence that it was found on the main ridges of the island either. These ridges are often rocky and quite unsuited to such a large tree, and, moreover, a lumbering fruit like the coco-de-mer would be quite unable to attain such a site.

14. A GOOD CROP OF FRUITS OF LODOICEA in the Seychelles, some of them not developed.

Primitively Lodoicea probably formed a pure stand forest on these slopes and valleys (Brayer du Barre 1773 quoted in Fauvel 1909, p. 216). It would indeed be difficult to imagine many other plants surviving under the shade of the broad leaves of closely packed untouched groves of this tree. The fruit is specially adapted for such a situation, its only means of dispersal being an initial bounce upon falling to the ground and subsequent sliding, the thick husk covering the nut, its great weight and smooth toboggan shape being special adaptations towards this means of dispersal, which was no doubt further aided by the ground being thickly covered with dry slippery leaves. An interesting observation by La Perouze, 1773 (quoted in Fauvel p. 108) has significance in this connection. He writes "the leaves of this tree, several fathoms in width and length serve as a bridge to pass from one rock to the next." These limited capabilities for distribution explain why Lodoicea was unable to attain the summits of the ridges and why it was unsuited to the lowland plateaux. The diœcious nature of the species is also correlated with this gregarious habit.

The present distribution of Lodoicea apart from scattered relic trees is centered around the valley of Anse Marie Louise and the Valley de Mai. The first locality is the site of the Government reserve and the second of a private reserve. In neither place are the Lodoicea forests in a primitive condition. Old trees have probably been cut and many have died, whilst natural regeneration has been limited by the systematic collection of nuts which have some commercial value. The resulting thinning of the palm groves have thus afforded place to a considerable invasion of other vegetation which must be considered to be a secondary characteristic.

The Anse Marie Louise reserve extends from a little above sea level to a height of some 500 feet. The lower parts consist of a boulder-strewn stream valley with pockets of soil which may be described as a brown granitic loam. Here the coco-de-mer has to compete with an abundant growth of indigenous but not endemic species of trees of a lowland type, such as *Adenanthera pavonina* and *Terminalia Catappa* together with certain exotics such as *Anacardium occidentale*. The formation may best be described as a secondary woodland, with a closed canopy at a mean height of 60 feet, and with the ground covered with rocks and dead leaves, bare of vegetation, except where more open areas are clothed with fern (Nephrolepis sp.). There are abundant seedlings of Lodoicea present but these are severely overgrown with saplings of Adenanthera.

At higher levels, 500 feet, this woodland merges into a more characteristic association composed of many endemic species, but still of a secondary nature. This formation may be described as a secondary mixed palm forest in which past cutting has been extensive, but fire has probably been infrequent and, if at all, many years ago. This forest covers steep westerly slopes of brown granitic loam, boulders being rather scarce.

The coco-de-mer towers above the other vegetation, but the canopy is formed at a lower level by the smaller species of palms. The floor of the forest is covered with dry palm leaves and is bare of vegetation except for palm seedlings. Sprouting coco-de-mer are well represented and in certain places form an impenetrable sort of second story composed of a palisade of 15-foot petioles surmounted by the 10-foot leaves, which together with a tangle of fallen leaves from the big trees afford a glimpse of what the original coco-de-mer forest must have been like. The older trees themselves are in fact probably survivors from the original forest but they have cer-

15. A CROP OF SEYCHELLES-NUT in Demerara (British Guiana), borne near the ground on short low trees, not usual on Praslin.

tainly experienced many vicissitudes, and the various other plants present are all secondary.

The Valley de Mai reserve occupies a basin-like valley with a mean elevation of 500 feet surrounded on all sides by higher ground. Some very fine specimens of Lodoicea can be seen here, but recent clearing of all vegetation has converted these palm groves into a semi-cultivated plantation.

The former wider distribution of coco-de-mer in comparatively recent times is manifest by the abundant dry roots which remain embedded in the soil of eroded hillsides all over Praslin. It is significant, however, that neither roots nor living trees are found on the higher ridges.

Germination of Lodoicea

Many inharmonious statements have been made about the germination of Seychelles-nut. It is commonly considered to be a difficult subject. A "sinker" or "rope" extends from the germinating nut, and this may reach some distance horizontally if it does not meet conditions proper for entering the soil. One may note the micropyle or "eye" at the apex of the broad

16. NUTS PLANTED FOR GERMINATION in the Seychelles. Nut at upper left is beginning to sprout.

basal sinus, and from this area the plantlet or shoot or haustorium emerges. The "rope" is not hypocotyl (axis or node below the cotyledon), as may have been supposed, but elongated base of the cotyledon itself, tipped by the radicle and containing the plumule. Similar growth is a phenomenon in Latania, Sabal and other palms. Picture of a germinating Lodoicea nut may be seen in Gardeners' Chronicle, January 21, 1893, page 69, repeated March 11, 1916, page 141. For reference on palm germination, see C. L. Gatin, Recherches anatomiques et chimique's sur la germination des Palmiers, Ann. Sci. Nat. Bot. France, sér. 9, iii, 191 (1906); also Lucy Boyd, Monocotyledonous seedlings, Trans. Bot. Edinb. xxxi, pt. i (1932).

Undoubtedly the variable results in the germination of Lodoicea are conditioned in part on the ripeness or maturity of the nuts when gathered. The germination is managed like that of the coconut, the seed being laid on the ground where moisture may be retained but standing water avoided.

In 1910 Sir W. T. Thiselton-Dyer published a morphological note on the germination of Lodoicea in Annals of Botany, xxiv, 223, but the material available did not allow of experimental studies. The germination of this great nut is much in need of careful investigation. In fact, the morphology of the fruit or nut itself is not yet well understood, and we may need to modify our descriptions of it when the natural history is worked out. The investigator should have abundant material, not merely a few mature nuts, and be able to trace the embryology; this should mean an investigation on Praslin itself.

In the meantime, I asked my correspondent, Mr. Vesey-FitzGerald, to describe the practice of germinating the nuts in the Seychelles. He writes that he has not been able personally to verify the great intervals of time required for the germination of this palm but the epochs are supplied by competent planters who have had experience. His interesting account now follows.

Subsequent to fertilization the nut grows in size for a period of some ten months, at the end of which time it is full sized. A nut that is in this growing period may be recognized by the fact that there is a narrow yellow line immediately outside the clasping bracts at the base. This line represents the most recently exposed part of the husk. Subsequently, upon exposure to light, it becomes green. A nut that is just at the end of this period of growth, i.e. full or nearly full sized but still showing the yellow line, is in a fit state to eat. The endosperm up to this time is jelly-like and incloses a small water-filled cavity. The husk, exocarp, is comparatively thick.

The nut remains on the tree for a further period of about five years. During this time, as explained above, the fruit does not increase in size. The most noticeable changes that take place during this period of ripening are that the endosperm "sets" and the exocarp becomes thin and dry.

The fruit now falls to the ground and throughout Seychelles all such fruits are collected and dehusked. The process is accomplished by simply

hitting the fruit on a rock which splits the husk and allows the nut to be extracted. The husk at this time is very fragrant.

Nuts selected for germination are stored for a period of about six months. They may then be planted, which consists simply in laying them on moist soil (Fig. 16).

A positively geotrophic "shoot" grows from the region of the septum between the two lobes of the nut and penetrates the soil for a certain depth, 1½ feet in one example examined.

The nuts shown in Fig. 17 were dug up and turned upside down after a period of about two months growth. A nut cut open at this time will be completely filled with the hard white endosperm. Situated in the septum between the two lobes of the nut is an "eye." Immediately on the inside of this, embedded in the endosperm which is soft and somewhat pasty at this point, is a more or less rounded pale yellow haustorium. Immediately derived from the haustorium is the positively geotrophic "shoot" which penetrates the "eye" and forces its way towards the ground by the most direct way possible.

The descending shoot at a depth of 10 inches, in a specimen examined, swells out to form a spindle-shaped body 12 inches long and 2½ inches cross-section. At the bottom end of this "spindle" the true "germ" is situated. From this point the spear-shaped plumule grows towards the surface. At first the plumule passes through the center of the "spindle," but at the top end it pierces the outer wall of the "spindle" and continues towards the surface through the soil.

While the plumule is growing upwards from the "germ" a tap-root descends, in reality forming a continuation of the positively geotrophic

17. NUTS OF LODOICEA taken up after sprouts have formed and placed bottom side up on a Lodoicea leaf. Seychelles. Note variation in shape of nuts.

"shoot" from the bottom end of the "spindle." Simultaneously lateral roots, five in number in the specimen examined, enter the soil at right angles to the axis of the tap-root. At this stage the haustorium within the nut has increased in size and is bilobed, one lobe occupying each half of the nut. Immediately around the haustorium is a zone of cheesy endosperm. The rest of the endosperm which occupies the whole of the remainder of the interior of the nut is pure white and ivory hard. A nut in the stage described would be about nine months after germination had commenced. The plumule continues its growth toward the surface and usually does not stop growing until it projects 1 or 1½ feet above the level of the ground. At this stage the first leaf is produced which arises from within the clasp of the plumule. The seedling may now be considered established and in about three or four years the connection with the nut rots away and the young tree becomes independent.

2. **DECKENIA,** Wendl. ex Balf. f. in Baker, Fl. Mauritius & Seych. 385 (1877); Benth. & Hook. Gen. Pl. iii, 898 (1883) as subordinate to Acanthophœnix.

Monotypic genus in the Seychelles. It bears the name of Baron von der Decken, African explorer.

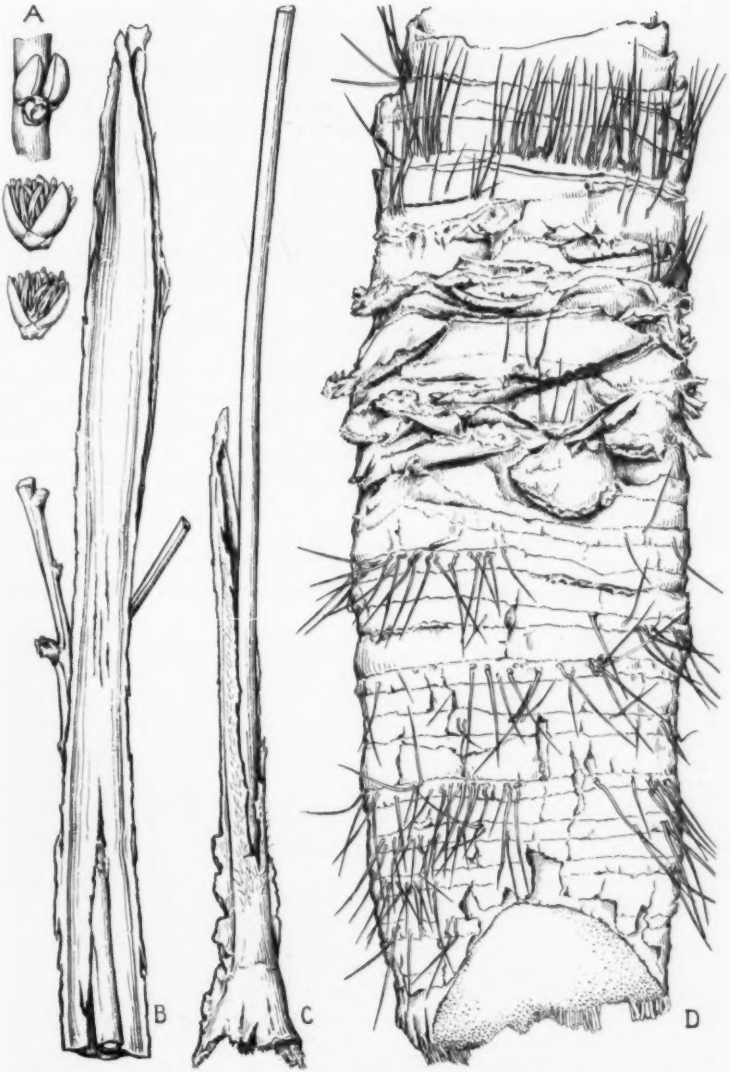
First note of this generic name appears to be the brief comment by Berthold Seemann in Gardeners' Chronicle, 1870, page 561, together with a picture of a juvenile plant, the name Deckenia being attributed to Wendland. The following year the same picture was printed in The Florist, page 252, with comment, by Thomas Moore. These items, even with the picture, are not sufficient to constitute botanical publication. Many of the horticultural names of palms were never sufficiently published in their time. The criteria of botanical publication were not then highly developed.

Deckenia nobilis, Wendl. ex Balf. f. in Baker, l.c. 386 (1877). Figs. 3b, 19, 20, 21.

Areca nobilis, Hort. ex Moore, in The Florist, 1871, 252.

Acanthophœnix nobilis, Blatter, in Journ. Bombay Nat. Hist. Soc. 1915, p. 517.

Enormous tree at full growth, monœcious, sometimes 30–40 m. tall, but trunk slender and usually not much if any more than 3 or 4 dm. diameter, erect, bole single, not spiny in age, annulate, usually bearing a few exposed roots at ground level: leaves long-pinnate, 2–5 m. long, the narrow gradually pointed pinnæ equally placed in 60 or more pairs, the long upright tubular sheath and the petiole spine-bearing in the young plant but unarmed or only setose at maturity; petiole on grown trees plano-convex, thin-edged, 4–6 cm. broad, not elongated, upper surface of rachis hairy-furfuraceous; pinnæ 4–5 cm. or less broad, with several strong ridges and ribs and finer longitudinal veins between, glabrous on upper surface (unless on juveniles) but bearing scattered strigose hairs underneath, the very long points only very briefly split, margins plain: spadix infrafoliar, 1–2 m. long, with long drooping rachillæ; spathe very short, 4-valved, about 4 dm. long and 1–2 dm. broad, the two main valves about equal and disarticulating from near the expanded base of the spreading or arching peduncle, each variously covered with brown bristles or hair-like spines little if any exceeding 2–3 cm. long and not needle-like but widely variable in investiture on different trees: rachillæ slender secondary branches of the rachis 30–50 cm. long, terete or slightly angled, glabrous, more or less glaucous, pendent: flowers not sunken in the rachis; staminate very small and closely placed, about 2 mm. across at anthesis, 3 petals ovate and lightly imbricate at base, sepals minute, stamens 9, with globose anthers that about equal the



18. DETAILS IN ARECAN PALMS of the Seychelles. A, *Stevensonia Borsigiana* flowers, × 2, showing the single pistillate between and below two staminates, and two separate staminates in anthesis. B, spathe of *Roscheria melanochætes*, × ¼, with indication of the branching spadix behind it. C, spathe of *Nephrosperma Vanhoutteanum* with the continuing peduncle of the spadix, × ¼. D, section of trunk of *Verschaffeltia splendida*, × ½.

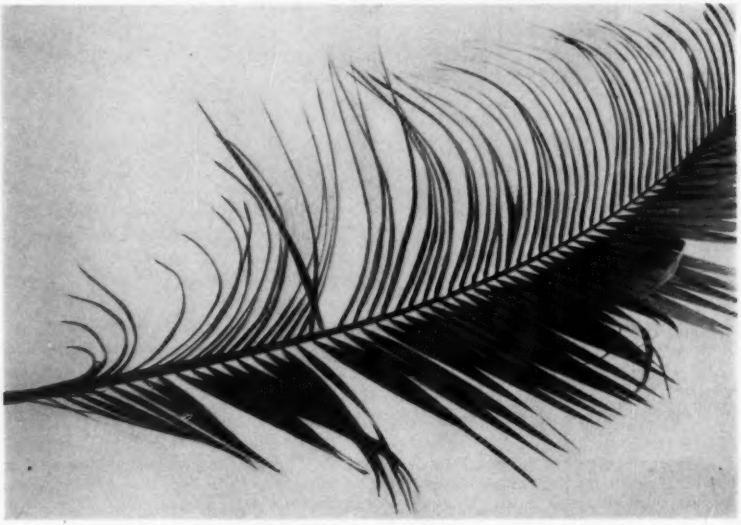
petals, pistillode a minute trifid body; pistillate flowers very small, borne normally between two staminates, globular, envelopes strongly imbricate, staminodes a little cup: fruit conic-oblong, dark mauve at maturity, 10 mm. long when dry, oblong and tapering to obtuse apex, striate, one side nearly straight and the other convex, said to be black when fresh but drying dark straw-colored, calyx not adhering, micropyle a disk at one corner of base, albumen homogeneous.

Different islands in the Seychelles, most abundant on Praslin. Aside from abundant material from the Seychelles, I have Deckenia also from Mauritius, Java, Trinidad and under glass. In the Seychelles the "cabbage" is eaten as a salad and the leaf-sheaths for trough-like containers and sandals.

Deckenia in the Seychelles (Vesey-FitzGerald)

The Deckenia palmetum is confined to highland knolls and ridges at an elevation of about 1,000 feet and it is best represented at the present time in Praslin. The former wider distribution of this species is manifested by individual trees occurring on all the palm islands anywhere from the sea level to nearly 2,000 feet, but this palm has suffered in general the same fate as other native species and in particular it is extensively cut for the sake of its "cabbage."

Horne (about 1875) records this palm as "becoming scarce," but in Praslin at least Deckenia is one of the most abundant species at the present



19. LONG PINNATE LEAF of *Deckenia nobilis*. Seychelles.

time. As with Lodoicea, the mountains and valleys of the western end of Praslin have provided a sanctuary for this species. None of the present forests, however, can be considered to be primary, though certain restricted areas may never have been burnt.

The highlands above the relic Lodoicea forests are largely covered with Deckenia. This country is composed of ridges and steep slopes, often culminating at their highest parts in piles of huge boulders, but more generally consisting of a granitic loam, with a rich superficial humic layer of fine rootlets and forest debris, which however is quickly destroyed if exposed and is nowhere, at the present time, of any great depth.

The association of today, being entirely secondary, is not composed of very big trees. In the closer palm stands the canopy is at about 30–35 feet, elsewhere there are open patches and the sunlight reaches the floor. Under a close canopy the forest floor is thickly covered with a dangerously inflammable mass of dry palm leaves and is devoid of all vegetation except for seedling palms. Open places are choked with dense tufts of a species of sedge.

Deckenia tends to crowd out all other plants except Stevensonia which becomes rare at higher elevations, Randia species, *Memecylon Elæagni*, and *Erythroxylon laurifolium*, all of which are constant associates. Elsewhere as a result of cutting and the subsequent breaking up of the canopy, Deckenia becomes relatively less abundant and many other species relatively more abundant, the forest being best described as a semi-open woodland of small trees and shrubs.

An outlier of this formation survives in Mahé on a sugar-loaf-like hill above Grand Anse. This area is a rounded hill, mean elevation about 1,288 feet, sloping steeply on all sides which are often sheet cliffs with only occasional ledges supporting vegetation. The summit is rocky with pockets of a

20. THE SPINY SPATHE of Deckenia, nearly ready to fall from the peduncle, showing the inside valves. × ⅓. Variable in size and covering, sometimes the spines very few. Seychelles, but photographed at Ithaca.

coarse-grained granitic silt. The hill is adjacent to, but with no highland connection with, the central Morne Seychellois massif. The mountain rain forest elements are, however, very poorly represented and in their place is a much drier type of forest dominated by Deckenia, which has been extensively cut in the past and continues to be in the present. This relic palmetum is very reminiscent of Praslin, though some of the subsidiary species are rather different.

In Silhouette Island Deckenia has been found in secondary lowland Adenanthera forest near sea level. Under these conditions the species is represented as a frequent tree reaching up to and forming part of the canopy. The incidence of Deckenia as an element in the primary lowland forests is now, of course, quite impossible to trace. The habitat of this plant, however, may be said to include all types of country from sea level to something over 1,200 feet. At the higher elevations it reaches its most luxuriant development today, but the species never enteres rain forest formation.

3. **STEVENSONIA,** Duncan, in Cat. Roy. Bot. Gard. Mauritius, 1863, *nomen;* Hogg, Gardeners' Year-Book, 52, 1864 (1865); Veitch, in Proc. Roy. Hort. Soc. London, iv, 134 (July 1864); Van Houtte, in Fl. des Serr. xv, 177, t. 1595–6 (1865); Balf. in Baker, Fl. Mauritius & Seych. 388 (1877); Benth. & Hook. Gen. Pl. iii, 908 (1883). The name has been erroneously written Stephensonia. It commemorates Governor Stevenson of Mauritius, who encouraged the botanical explorations of the Director of the Mauritius Botanic Gardens, Mr. J. Duncan, who discovered the palm on Round Island, one of the Seychelles.

Phœnicophorium, Wendl. in Ill. Hort. xii, Misc. 5, t. 5 (Feb. 1865).

Monotypic genus in the Seychelles although first brought to botanical notice in cultivation and supposed in some quarters to have come from Brazil or other countries.

The generic title of this palm is confused. It was in the period 1855 to 1865 that young plants of it in cultivation began to receive names. The terms of publication of these names are not satisfactory, yet it is hardly allowable to invent a new and properly published name to displace them. Stevensonia is the older of the two generic names but Phœnicophorium ("thief palm") has the merit of a brief technical diagnosis. The name Stevensonia may lack somewhat in formal botanical regularity, particularly in qualifications adopted subsequent to that period, but no doubt is raised as to its identity or application. The circumstances of the name

Phœnicophorium should not constitute a worthy basis of nomenclature. These questions I studied some years ago and the conclusions are published in Gentes Herbarum, ii, 192, 438, and iii, 115.

In his account of the Old World species of the Areceæ, Beccari adopts Stevensonia in preference to Phœnicophorium. This action is apparently based on supposed occurrence of a prior Phœnicophorium of Blume, but this is an error, for the earlier genus is Phönicanthemum. (Cf. La Sinonimia delle Palme Gerontogee della tribù delle Areceæ in Nuovo Giornale Botanico Italiano, xlii, 17–88, 1935, published posthumously.)

Stevensonia Borsigiana, Bailey, Gent. Herb. ii, 192 (1930). Figs. 3c, 18, 22, 23.

Astrocaryum Borsigianum, K. Koch, in Wochenschr. Gärt. u. Pflanzenkr. 401 (1859); Gartenfl. 1861, 29.

Astrocaryum Borsigii, A. aureo-pictum, Hort. ex Koch, l.c.

Areca sechellarum, Hort. ex Koch, l.c.

Astrocaryum aureo-punctatum, Lem. in Ill. Hort. vi, note sub t. 229 (1859), *nomen.*

Stevensonia grandifolia, Duncan, in Cat. Roy Bot. Gard. Mauritius, 1863, *nomen;* VanHoutte, in Fl. des Serr. xv, 177 (Apr. 1865); Nichols. Ill. Dict. Gard. iii, 502 (1888).

Stevensonia sechellarum, Van Houtte, in Fl. des Serr. xv, t. 1595–6 (Apr. 1865).

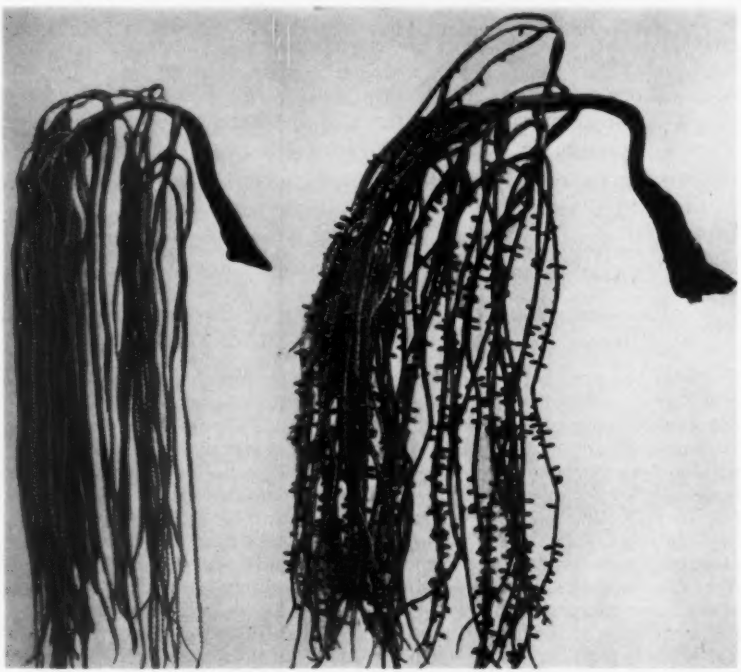
Phœnicophorium Sechellarum, Wendl., in Ill. Hort. xii, Misc. 5, t. 433 (Apr. 1865).

Phœnicophorium Borsigianum, Stuntz, in Invent. Seed and Pl. Import. No. 31, p. 88, Bur. Pl. Ind., U. S. Dept. Agr. (1914).

Erect, monœcious, trunk single, slender at maturity, 10–16 m. tall, bole spiny when young but becoming nearly or quite smooth with age, usually not straight, rather prominently ringed, perhaps 8–10 cm. thick toward top at flowering age: leaves on mature trees with upstanding glabrous petioles with wide flanges and long scurfy sheaths that bear short appressed sharp but weak spines or aciculæ, the petiole concavo-convex in cross-section, petiole on young plants spiniferous; leaf-blade oblong, cuneate at base, more or less bifid at apex, 1–2 m. long and more than one-half as broad, pinnately ribbed and cut one-fourth to one-third the depth into narrow ribbed lobes that are short-notched at end, glabrous throughout: spadices in the lower axils and from which some of the leaves may have fallen, 1 m. and more long, much branched and bushy in anthesis but not equalling the leaf-blades; main or inner spathe spindle- to club-shaped, long-pointed, woody, glabrous and bearing minor lengthwise ribs, 50–100 cm. and more long and 10–16 cm. or more broad at dehiscence; rachillæ composed of

spreading and hanging secondary and tertiary glabrous angled slender branches 50–75 cm. and more long and issuing from the strong straight central rachis, peduncle of spadix long and prominent and unarmed: flowers small, not sunken in rachis, the staminates about 5 mm. long when bud is mature and the pistillates shorter and nearly globular, the plan being one pistillate with a staminate on either side but the upper parts perhaps all staminate and other strands nearly or quite pistillate; petals of staminate flowers at least twice longer than broad and valvate, the sepals very short, stamens 15 or more, anthers long, filaments short and connate at base, pistillode subulate; petals of pistillate flowers about as broad as long, imbricate, calyx very small: fruit greenish-yellow becoming red, oblong-ovoid, obtuse at apex, 8–10 mm. long and about one-half as broad but variable in size and shape, glabrous, the calyx usually adherent; albumen ruminate with intrusions; embryo near the base, the outstanding micropyle small.

Throughout the Seychelles on the lower levels. It has been a frequent palm as a juvenile under glass, grown for its ornamental bright green incised bifid but not pinnatisect leaves which are orange underneath and



21. STAMINATE AND PISTILLATE SPADICES of *Deckenia nobilis*, conspicuously hanging from the arched peduncles. About one-tenth full size. Seychelles.

sometimes marbled, reddish petioles with slender black spines; in the mature stage as a fruiting tree the spines have disappeared. In the American tropics the tree grows readily, marked by its large leaves not cut nearly to the midrib. I have materials also from Mauritius and Singapore and know it in Jamaica, Panama, British Guiana, Rio de Janeiro.

Full account of Stevensonia was given by J. D. Hooker in Botanical Magazine in 1893 (t. 7277). It is stated that three plants were sent to Kew in 1855 under the label name *Latania aurea* by J. Duncan the discoverer,

22. LEAF AND SPADIX of *Stevensonia Borsigiana* (*S. grandifolia*). About one-tenth full size. Seychelles.

who later gave it the title Stevensonia. In 1855 also, according to the German journal Wochenschrift, it was seen in Paris and a plant was purchased by Herr Borsig and sent to Germany where Koch gave it the first tenably published specific name.

One notices marked differences between trees and ages of Stevensonia, and there is notice in the literature of such dissimilarities. Apparently these are variations due to the particular conditions under which a tree grows, as well as to age; I have not been able to find evidences of more than a single species.

Stevensonia in the Seychelles (Vesey-FitzGerald)

Stevensonia Borsigiana is the most abundant of the endemic Seychelles palms and is found on all the palm islands from sea level to about 1,000 feet, above which elevation it is rarer. The abundance of this palm is due to its vigorous regenerative powers since not only is this species extensively cut, its leaves being used for thatching, but being confined to lower elevations the whole of its area has been more or less cleared for cultivation or swept by fire.

The finest present-day development of the species is to be seen in Praslin within the same area as the Deckenia forests. The Stevensonia palmetum forms a zone below the Deckenia formation, covering the lower slopes of similar ridges. This forest is certainly secondary and to what extent it represents the original vegetation is doubtful.

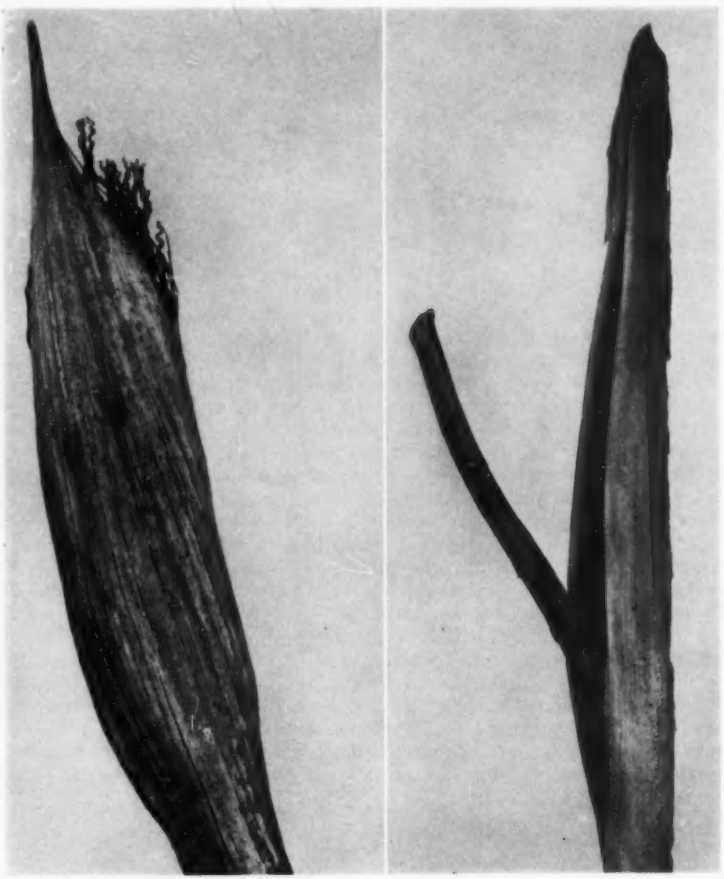
The Stevensonia palms form almost a pure stand, their leaves producing a close canopy some 40 feet high, into which only an occasional Deckenia or other outstanding tree is able to penetrate. The deeply shaded floor is thickly covered with dry palm leaves and is devoid of vegetation except for young palms. Randia and Erythroxylon are usual associates and, especially in ravines, several other plants are represented by scattered trees, these becoming relatively more frequent wherever the Stevensonia is not so thick.

The above forest may be regarded as a sort of climax towards which much of the regenerating vegetation of the burnt hillsides of Praslin is heading. Stunted rather yellow Stevensonia palms are a regular component of such vegetation, but it is doubtful whether the intermittent fires, continual cutting and consequent severe erosion will ever allow this objective to be attained over the greater part of the devastated area. It is, in fact, evident that continual cutting and burning will finally destroy Stevensonia entirely. This accounts for the absence of the palm from much of the cultivated areas of Mahé but otherwise the species is common below 1,000 feet on all the palm islands.

Stevensonia has been found as an abundant second-story tree in secondary Adenanthera forest on slopes at sea level in Silhouette. This palm

is also a constant and abundant element in relic forest areas throughout Mahé and Silhouette, but becomes less frequent above 1,000 feet and is apparently quite absent at 2,000 feet and above. It is also one of the commonest palms represented on the small islands round Mahé.

In none of the above habitats is Stevensonia found under undisturbed conditions. It is, therefore, difficult to assess the exact niche this palm filled in the past. It seems probable, however, that this species was a very abundant second-story tree in all forests below 1,000 feet. The cutting of



23. MAIN SPATHE of Stevensonia at left (Panama), of Verschaffeltia at right (Seychelles). About one-fifth full size. Photographed at Ithaca.

these forests may have brought about an initial increase of the palm elements, resulting in the almost pure stand palmetums just described. Subsequent fire and continual disturbance, however, led to the final extinction of the palm over wide blocks.

4. **ROSCHERIA,** Wendl. ex Balf. f. in Baker, Fl. Mauritius & Seych. 386 (1877); Benth. & Hook. Gen. Pl. iii, 913 (1883).

Monotypic genus in the Seychelles. The name is that of Albrecht Roscher, young traveller killed in Nyassa, Africa.

Roscheria melanochætes, Wendl. ex Balf. f. l.c. Figs. 3d, 18, 24, 25, 26.

Verschaffeltia melanochætes, Wendl. in Ill. Hort. xviii, t. 54 (1871).

Regelia melanochætes, Hort. ex Salomon, Palmen, iii (1887).

Small to medium-sized monœcious tree with single trunk, 5–8 m. tall, the erect irregularly ringed or scarred bole 6–8 cm. diameter, juvenile trunk bearing rings of black spines (whence "melanochaetes," black hairy or bristly) but mature trunk nude or with only few or scattered weak spines, aerial roots sometimes present at base: leaf pinnate, 1–2 m. or more long, the tubular sheath bearing many small black spines or aciculæ, petiole concave on upper face and thickly beset on dorsal margins with detaching short spines and spicules; leaf-blade bilobed on juvenile plants and the two parts entire, but pinnate on older plants with 10–12 pairs of very unequal pinnæ and deeply bilobed at apex; pinnæ 75 cm. or less long, differing in width from 1–10 cm., the broader ones truncate and coarsely toothed at end, the very narrow ones pointed, all of them strongly ribbed and nerved, glabrous on upper surface, more or less floccose in valleys underneath; rachis ridged and ribbed: spadix interfoliar but persisting until after the subtending leaf has fallen, 1–2 m. long, not exceeding leaf, about thrice branched or forked; main spathe 75 cm. or more long, thin and papery when dry, thin-edged, 5 or 6 cm. broad at dehiscence, nerved or striate lengthwise, glabrous and unarmed; rachillæ or ultimate branches 5–15 cm. long, very slender, glabrous, the primary and secondary divisions of the spadix flattened and angled: flowers very small, not imbedded, prevailingly 2 staminates and 1 pistillate at each insertion; staminate flowers with minute envelopes and 6 included connate stamens and a central columnar pistillode; pistillate flowers with single pistil and staminodes represented by a toothed ring: fruit globular to short-elliptic, becoming red, about 4 mm. diameter when dry, the exterior shell puckered in desiccation and soon weathering away leaving a beautiful anastomosing raphe covering the seed and that also disappears leaving a smooth seed nearly 3–4 mm. diameter; seed irregularly veined to mark the intrusions through the ruminate albumen, embryo at base.

Mahé and Silhouette islands.

Roscheria in the Seychelles (Vesey-FitzGerald)

Roscheria is a second-story tree of mountain forest at the present time

24. BEARING TREE of *Roscheria melanochætes*. Seychelles.

confined to Mahé and Silhouette, careful search not having revealed this species in Praslin.

In Silhouette Roscheria has been found locally in secondary Adenanthera forest at about 300 feet elevation. This is, however, quite exceptionally low for the present distribution of the palm, which hardly becomes abundant before about 1,500 feet. In the mountain moss forest, relics of which survive at greater elevations than 2,500 feet, Roscheria is very abundant, forming a well-marked second-story tier below the canopy of Northea and Neowormia. These forests are moist and frequently shrouded in mist. The soil, held on the usually steep slopes by rocks and a network of roots, is chestnut-colored, spongy and extremely rich in plant debris. The floor and second-story flora of these forests is well represented both in species and individuals, any break in the canopy causing it to become extremely luxuriant. Under these conditions Roscheria tends to form a pure stand. One such stand on the steep slopes just below the very summit of Morne Seychellois has the appearance of being entirely natural and undisturbed.

5. **NEPHROSPERMA,** Balf. f. in Baker, Fl. Mauritius & Seych. 386 (1877); Benth. & Hook. Gen. Pl. iii, 907 (1883).

Monotypic genus in the Seychelles. The name is compounded from the Greek, in reference to the kidney-shaped seed. Customarily the name is treated as if feminine, but it is a Greek neuter like Dictyosperma and Oncosperma, and I therefore change the ending of the specific name to correspond in gender.

Nephrosperma Vanhoutteanum, Balf. f. l.c. Figs. 3e, 18, 27.

Oncosperma Vanhoutteanum, Wendl. ex VanHoutte, in Fl. des Serr. xviii, t. 1798 (1868).

Erect monœcious medium-sized palm with single trunk 8–11 m. tall, bole 8–15 cm. diameter, mottled short-jointed leaf-scars brownish and spaces gray, making cord-like adventitious roots on lower part: leaf 1–2 m. long, making an attractive head of arching and drooping foliage; sheath of leaves on young trees bearing bristle-like spines but those of mature trees unarmed or with spines only along the middle; petiole short, usually not exceeding 40–50 cm. long, unarmed, deeply concave on upper surface and sharp-edged; blade 2–3 m. long, pinnate, the pinnæ 25–40 pairs and not uniformly placed or opposite, widest ones about 5 cm. broad and others much narrower, glabrous, 1 m. and more long, stiffly midribbed and with prominent side ribs and intermediate more slender longitudinal veins, margins plain and perhaps rolled, long-tapering to briefly bifid point: rachis conspicuous in the long spaces and covered with powdery bloom: spadix interfoliar, very slender, at least as long as the leaf and loosely simply and remotely branched, often 3–4 m. long, the thin whip-like

peduncle long-exserted from the flattened 2-edged somewhat hairy-spinose spathe that may become nude (main spathe 40–50 cm. long); rachillæ very slender, divaricate, arising directly from the terete and often superficially grooved rachis, the lowest ones to 75 cm. long and more or less drooping: flowers very small, not immersed, prevailingly 1 pistillate and 2 staminates at well separated intervals; staminate flowers oblong, about 5 mm. long, petals valvate, very short calyx imbricate, stamens 40 or more, the anthers very short, pistillode not divided; pistillate flowers very small, globular, envelopes imbricate, staminodes a lobed cup: fruit irregularly globose or somewhat flattened endwise, 10–12 mm. broad when dry, at first green in color then yellow and when ripe cherry-red, stigmatic point lateral and prominent, floral envelopes enlarged, dry shell thin and covering a fibrous layer; seed irregularly globose, 8–10 mm. broad, embryo and micropyle basal, surface lined with raphe, albumen abundantly ruminate.

Various islands in the Seychelles. Now widely planted; I have material also from Mauritius, Java, Singapore, and British Guiana where I have collected it.

Nephrosperma in the Seychelles (Vesey-FitzGerald)

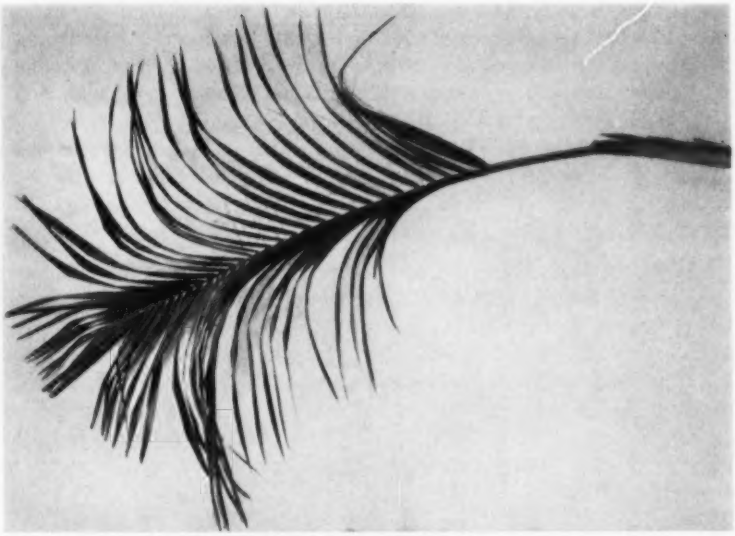
Nephrosperma, though abundant, is somewhat difficult to study ecologically. Being a lowland species its natural habitat has been greatly dis-

25. IRREGULARLY PINNATE LEAF of *Roscheria melanochætes*. Seychelles.

turbed, and although common in Mahé and Silhouette, it is infrequent in Praslin. Lastly, the most usual sites for this palm, exposed rocky clefts and shady stream ravines, appear, at first sight, the antithesis of each other.

The species has been found as an abundant second-story tree in secondary Adenanthera forest on coastal slopes in Silhouette. The river reserves in Mahé, in which Nephrosperma is characteristic, may be regarded as

26. THE LONG MUCH-BRANCHED SPADIX of Roscheria. Seychelles.



27. THE UNIFORMLY PINNATE LEAF of *Nephrosperma Vanhoutteanum*. Seychelles.

28. THE PINNATELY VEINED BUT IRREGULARLY CUT LEAF of *Verschaffeltia splendida*. Seychelles.

remnants of exactly the same formation. The terrain of these places is always rocky, with soil situated in pockets of varying extent. Such areas are very frequently adjacent to steep "glacis" or cliffs, where the rock is represented by solid slabs occasionally cracked into fissures in which soil material can collect.

A chasmophytic type of vetetation develops in these clefts composed of elements from the forest. If the clefts or ledges are extensive, quite big trees can grow and Nephrosperma is always a very characteristic plant in these situations, frequently forming little pure stand clumps.

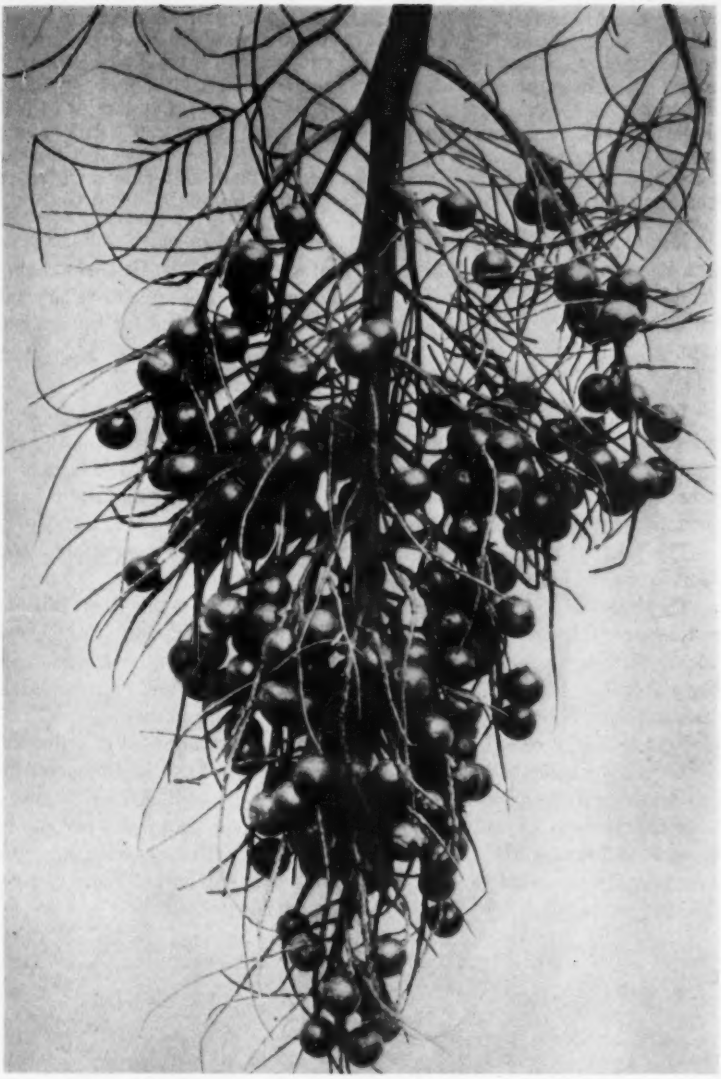
It will be seen, therefore, that the present habitats of the palm were linked up to form a continuous range covering all areas where pockets of soil exist between boulders or in rock crevices. The species becomes rare at about 1,000 feet, probably not occurring above 1,500 feet. It is worth noting that Nephrosperma varies in configuration according to habitat. In shady woodland the trunk is stout but not tall, the leaves are long and lax. In exposed places the trunk is slender, and tall specimens are frequent, some reaching 40 feet, while the meager crown is composed of comparatively small leaves.

6. **VERSCHAFFELTIA,** Wendl. in Ill. Hort. xii, t. 430, Misc. p. 5 (1865); Benth. & Hook. Gen. Pl. iii, 908 (1883).

One species in the Seychelles. Dedicated to Ambroise Verschaffelt, Belgian horticulturist, 1825–1886.

Verschaffeltia splendida, Wendl., l.c. Figs. 3f, 18, 23, 28, 29.

Erect tall monœcious palm reported to 25 m. tall but usually much less, trunk 2–3 dm. thick, variously black-aciculate from the prominent rings, most spiny when young and top of trunk of older trees bearing downwardly pointing rings of spines, developing aerial or brace roots that finally supply attachment of the tree to the ground with a conical support 1 m. across at the bottom, bole tapering gradually to top and to the disappearing base: leaves 2–3 m. long, 9–15 of them making a handsome crown of foliage, the petiole much shorter than the blade; petiole and sheath spiniferous on the young plant but unarmed on mature trees and more or less pruinose, sheath clasping the bole and petiole deeply concave on upper face; blade more than one-half as broad as long, bilobed at apex, often nearly entire on the margins on young plants, strongly pinnately veined and variously divided on the basal part nearly to the rib or rachis on old plants but not pinnatisect throughout unless on young plants, main body narrowly cleft or slit to one-third or one-half or more the depth, the divisions strongly ribbed and with oblique jagged ends, smooth on both surfaces except perhaps with floccose flecks on under side toward base: spadix interfoliar, 1–2 m. long, branching and forking perhaps 1 m. long, peduncle somewhat compressed, furfuraceous; main spathe about 75 cm. long, chartaceous when dry, thin-edged,



29. FRUITING SPADIX of Verschaffeltia. × ¼. Seychelles.

3–5 cm. broad, finely striate, unarmed and glabrous; rachillæ very slender, pubescent or furfuraceous until weathered, 10–25 cm. long, bearing typically a pistillate flower between and below two staminates at each intersection and not sunken; staminate flowers globose, the valvate petals scarcely longer than the imbricate calyx-lobes, stamens 6; pistillate flowers globose and larger, 2–3 mm. across, the envelopes imbricate, staminodes 6: fruit globose or slightly tapered to base, 20–25 mm. transverse diameter, glabrous but roughened when dry, green, stigmatic remains near the base, shell thin but becoming hard and separated from the thin-ridged endocarp; seed very hard, ridged endwise, albumen much ruminated from the walls.

Mahé, Silhouette, Praslin. An attractive palm in cultivation. I have seen it under glass, and in the West Indies on Jamaica, Guadeloupe and Trinidad; I have good material from Singapore. In the Seychelles the split trunks are employed for the making of water gutters and for the walls of huts.

Verschaffeltia in the Seychelles (Vesey-FitzGerald)

Verschaffeltia occurs as a frequent tree, reaching to the canopy throughout relic forest on slopes between 1,000 and 2,000 feet in Mahé and Silhouette. This palm is rare at 500 feet and is found at present only in river reserves below this height. The species is also absent in the mountain forest formation which develops above about 2,300 feet.

The plant is infrequent in Praslin where it occurs only as a fairly constant element of the flora of steep-sided river ravines.

The habitat of Verschaffeltia may be described as the steep hillsides and ledges of intermediate elevation where it occasionally forms little colonies but is more usually represented by frequent but scattered trees. The natural incidence of this species has been much affected by the fact that its trunk, split into laths, is used extensively in building.

Verschaffeltia exhibits the most exaggerated development of stilt-roots of all the Seychelles palms, though both Roscheria and Nephrosperma as well as several other plants of the mountains are equipped in this way. Evidently these stilt-roots are an adaptation to steep slopes and potentially dynamic soil conditions. It is significant, therefore, that they should reach their best development in the species which is most characteristic of steep hillsides, mountain ledges and precipitous ravines.